4.9 HYDROLOGY AND WATER QUALITY

This section discusses the existing hydrological setting for the Project site, including regional and local surface water and groundwater characteristics based on available information about the Project, consultation with County staff, review of geotechnical and environmental reports, other published materials, and site reconnaissance. Based on existing hydrologic information, this section identifies potential impacts that could result from the Project, and recommends mitigation measures.

IMPACTS EVALUATED IN OTHER SECTIONS

The following subjects are related to Hydrology and Water Quality, but are evaluated in another section of this document:

- Potential biological impacts to aquatic life in waterways are evaluated in Section 4.4, Biological Resources.

SETTING

Climate

Solano County's Mediterranean climate is typified by warm dry summers and mild winters. Rainfall distribution is affected substantially by topography with most of the rainfall being concentrated along the western county border over the Vaca Mountain range. Average annual rainfall varies throughout the County from 15 to 40 inches with the greatest amount occurring over the Vaca Mountains, with levels decreasing easterly away from the mountains. The overall mean annual precipitation for the Project site is approximately 17 inches (PRISM 2010).

Regional Surface Waters

The Project site lies within the San Francisco Bay Area Hydrologic Basin. The San Francisco Bay functions as the drainage outlet for waters of the Central Valley and the greater Bay Area. Freshwater strongly influences environmental conditions in the San Francisco Bay Estuary. Over 90 percent of the estuary's freshwater originates from the Sacramento and San Joaquin Rivers and enters the northern reach (RWQCB 2007). In the San Francisco Bay Basin Plan, the Regional Water Quality Control Board identifies a number of beneficial uses of surface waters that must be protected. The beneficial uses for San Francisco Bay include agricultural supply, area of special biological significance (ASBS), cold freshwater habitat, freshwater replenishment, groundwater recharge, shellfish harvesting, warm freshwater habitat, estuarine habitat, preservation of rare and endangered species, fish migration, fish spawning, wildlife habitat, navigation, recreation, commercial and sport fishing, and industrial service supply (RWQCB 2007).

Local Drainage

The Project site is located in the Vaca Mountain range, is approximately 468 acres, and ranges in elevation from 200 to 965 feet above mean sea level (msl) (NAVD88). A small portion of the total area is impervious. The active quarry portion of the Project site is currently designed so that much of the runoff from the quarry and processing areas drains toward the main quarry pit. Runoff that does not drain towards the quarry pit is collected in existing detention basins and used in mining and/or process related activities. A small portion of the stormwater that falls on the western portion of the Project site is conveyed to Blue Rock Springs Creek, which eventually discharges to Lake Chabot which outlets to the Napa River and ultimately San Pablo Bay. Drainage from the east side of Sulphur Springs Mountain flows to Sulphur Springs Creek, eventually draining into Lake Herman to the south and then ultimately San Pablo Bay.

The existing Project site has been divided into seven sub-watersheds, referred to hereinafter as basins. Each basin has a discrete stormwater discharge location at the existing property boundary (Figure 4.9-1 Existing Conditions Basins Delineation). Each of the basins is described in further detail below.

- Basin 1 contains an asphaltic concrete drum mix plant as well as a maintenance shop area. Some stormwater runoff generated in Basin 1 is collected in stormwater detention ponds which discharge to Outfall B and eventually to Blue Rock Springs Creek.
- Basin 2 contains a small vegetated slope area that is undeveloped and drains to Outfall C. In addition, Basin 2 contains one detention pond which store onsite stormwater runoff generated from plant operations that occur in Basin 2. The detention pond stores the stormwater runoff for re-use in plant operations. The stormwater detention pond has an overflow discharge to Outfall C if water surface elevations within the pond exceeds the pond capacity.
- Basin 3 consists of an equipment parking lot, a surplus equipment storage area, and a material recycling plant. A portion of Basin 3 drains to Outfall A, primarily through two drop inlets and a vegetated roadside swale that eventually drain to Sulphur Springs Creek. The remainder is pumped into Basin 4.
- Basin 4 consists entirely of the active quarry pit which directs all stormwater runoff into the center of the pit. Basin 4 does not discharge any stormwater runoff off-site.
- Basin 5 consists entirely of undisturbed land cover. Stormwater runoff generated in Basin 5 sheetflows off-site into the Sulphur Springs Creek drainage.
- Basin 6 contains undisturbed land cover on the eastern boundary of the existing quarry pit. Stormwater runoff generated within Basin 6 flows to the east and discharges to Sulphur Springs Creek.
- Basin 7 consists of undisturbed land cover with stormwater discharging offsite to the northeast into Sulphur Springs Creek. Sample Point F lies to the northeast of Basin 7.

Water Quality

For quarry operations, one of the main concerns for water quality is sedimentation due to the significant amount of fine grained soils that are produced through mining and processing activities. Mining activities at the Project site are subject to the requirements of the State Water Resources Control Board (State Water Board) Water Quality Order no. 97-03-DWQ National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000001 Waste Discharge Requirements for Discharge of Storm Water Associated with Industrial Activities Excluding Construction Activities (referred to hereinafter as the General Permit). The General Permit, which is administered by the State Water Resources Control Board (State Water Board), regulates discharges from certain types of industrial facilities, including mining operations. The General Permit does not provide enforcement if benchmark values are exceeded. The benchmarks are provided as guidelines for comparison to gauge improvement in the quality of the water discharged from the project site. The Quarry has conducted quarterly stormwater monitoring at seven outfall locations since 2005. The Quarry reports to the State Water Board the results of the stormwater sampling. While benchmark exceedance is not a permit violation, the Quarry utilizes the monitoring data to determine the overall effectiveness of their control measures and to assist in knowing when additional corrective action(s) may be necessary.

Concepts of Groundwater Hydrology

Groundwater is defined as subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated. When and where groundwater occurs in a saturated geologic unit that contains a sufficient permeable thickness to yield significant quantities of water to wells and springs, it can be defined as an aquifer. A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers. Designated groundwater basins rarely align precisely with drainage due to variations in geology, water-bearing capacity, and groundwater flow characteristics. In addition, not all areas are included within a designated groundwater basin due to a lack of suitability as a groundwater source.

Regional Groundwater

The volume and location of groundwater utilization for municipal, agricultural, and rural residential uses has not been quantified. Historically, agencies in the region have used groundwater as the primary supply prior to the Solano Project development and in recent years have transitioned to other sources [Solano Agencies Integrated Regional Water Management Plan (IRWMP), 2005]. Despite a history of groundwater dependence, many areas have little to no groundwater monitoring or groundwater problem identification. The Project site is not located within a designated groundwater basin or subbasin, as identified by the San Francisco Bay Regional Water Quality Control Board Basin Plan (RWQCB 2007). The California Department of Water Resources has no groundwater level monitoring locations in the vicinity of the Project site (DWR California Data Exchange Center 2010), indicating that important regional groundwater supplies are not reasonably exploitable in this area. While groundwater is known to occur in geologic units similar to that underlying the site, it does not occur in quantities and/or yields that would allow for economically feasible extraction at this time. However, some shallow wells exist in areas of Solano County that are not designated to a particular basin or subbasin. The bulk of groundwater aquifer usage and availability comes from the northeastern portion of the County (Pers. Comm., Rick Fowler and Andy Florendo, Solano County Water Agency, 2010). Groundwater in the vicinity of the Project site is most likely replenished by percolation from higher elevation hills, subsurface inflow from the adjacent basins and subbasins, rainfall on the valley floors between the hills, and percolation from urban water irrigation (artificial recharge) to the west and south.

Local Groundwater

Based on the best available information, local groundwater resources in the vicinity of the Project site are limited to: perched water zones in the higher elevation areas that surface as small seeps and springs; occupy colluvium within the slopes around the mountain; and occupy the shallow alluvial sediments in the valleys between the higher elevation hills. Three shallow 60-foot deep groundwater monitoring wells exist within the boundaries of the Project site. One monitoring well (MW-1) is located on the westernmost portion of the site adjacent to the quarry perimeter road, near the old shop, at approximately 375 feet msl. The second monitoring well (MW-2) is located within the catch basin below the Aggregate Processing Area (rock feeding, crushing, and sorting operations) in the northwest portion of the site at approximately 400 feet msl. Well MW-2 is generally not considered here to be representative of naturally occurring shallow groundwater due to water inflow from the Aggregate Processing Area catch basin. The third monitoring well (MW-3) is located in the northern portion of the site on a steep northwest facing slope at approximately 500 feet msl. The existing quarry does not utilize groundwater for daily operations. Use of groundwater underlying the project site is not planned as part of the proposed Project use of residential wells in the vicinity was discontinued prior to 2005 (Pers. Comm., Rick Fowler and Andy Florendo, Solano County Water Agency, 2010).

Groundwater levels from site groundwater monitoring wells are not recorded routinely or historically (Pers. Comm., Jennifer Gomez, Syar Industries, 2011). However, water levels and total well depths were recorded by a Winzler & Kelly geologist on January 14, 2011. Therefore, groundwater levels, flow direction, and gradient discussed here are estimated using data from the monitoring well data recorded in January 2011, from environmental groundwater quality monitoring sites to the west, surface flowing water bodies (creeks), and topography.

Despite the fact that the Project site overlies an area not previously defined as a groundwater basin, quantities of shallow groundwater were present (depth to water in MW-1=12.25 feet bgs, MW-2=11.15 feet bgs, and MW-3=20.10 feet bgs) in January 2011 and at approximately 50 feet bgs at the time of the monitoring wells' construction. Local groundwater most likely varies naturally in response to seasonal rainfall patterns within the shallow soils and colluvium materials on the steep slopes of the site and within the alluvium deposits that lie immediately adjacent to and topographically lower than the site.

Dense rock materials below the site most likely limit the quantity of groundwater present at lower depths in the open fractures and joints of the rock. Rock surfaces on the sides of the quarry pit so far have not exhibited seeps, springs, or fractures with volumes of water that would indicate groundwater flows into the quarry pit above 175-feet msl (the current bottom of the pit). It appears as though only surface waters from rain events affect the quarry pit water levels (Pers. Comm., Jennifer Gomez, Syar Industries, 2010).

Rainy season surface water flow into the pit maintains a 50-foot deep water body and the water level in the pit throughout the year fluctuates by approximately 10 to 15 feet, with an average surface water elevation of 225 feet msl. During the summer and early fall months water is pumped out of the pit for dust suppression and aggregate materials processing (Pers. Comm., Jennifer Gomez, Syar Industries, 2010). These observations reinforce the belief that: the shallow groundwater observed in site monitoring wells is generally limited to occupying the soil/colluvium materials that overlie the bedrock contact around the site; is limited in volume; and is dependent on the quantity of upland rainfall and infiltration that occurs during the rainy months of the year. Additionally, the quarry water use activities of pumping water from the pit to the hot plant, which in turn flows to the retention basin, are assumed here to have a temporary and limited groundwater mounding effect within the catch basin area.

In the northern portion of the site shallow groundwater is assumed to flow to the northwest and northeast due to orientation of the sloping topography, observed shallow groundwater (20.10 feet bgs) in monitoring well MW-3, and observed year-round green vegetation (seeps and springs) on those slopes. Groundwater gradient is assumed to be relatively high due to the steep mountain slopes ranging from approximately 350 to 950 feet elevation relative to msl.

In the eastern and southeastern portion of the site shallow groundwater is assumed to flow to the east and southeast due to orientation of the sloping topography, observed year-round green vegetation (seeps and springs) on those slopes, and the orientation of the flow direction of Sulphur Springs Creek and the valley. Groundwater gradient is assumed to be relatively high due to the steep mountain slopes ranging from approximately 250 to 1,000 feet elevation relative to msl.

In the southern to western portion of the site shallow groundwater is assumed to flow to the south and west due to the south and west sloping topography, the presence of shallow groundwater in a site monitoring well (MW-1), the orientation of the flow direction of Blue Rock Springs Creek, and from monitoring well data two miles west of the project site. Groundwater gradient is assumed to be relatively high due to the site's location on a steeper sloping mountain 400 to 900 feet elevation relative to msl. The gradient most likely decreases a mile to the west where the surface flattens and the elevation is approximately 80 feet above sea level.

Alluvium, generally greater than 20 feet thick, overlies much of the lower topography west and south of the Project site, and hosts the shallow aquifers below the cities of Vallejo and Benicia. Monitoring wells in a shallow water bearing unit approximately 2 miles west of the Project site (at 95 feet above msl) indicate groundwater on average (SWRCB GeoTracker database 2010) ranges from the ground surface to 15 feet below the ground surface (bgs), and the hydraulic gradient is approximately 0.09 feet per 100 feet. The shallow aquifer beneath the cities could be affected by local pumping, upstream naturally occurring and artificial reservoirs, volume and timing of artificial recharge, bedrock fracture and joint patterns, and local climatic variations.

According to the SWRCB GeoTracker database (2010), groundwater quality to the west, 2 miles and greater from Project site, has been impacted by petroleum hydrocarbons from gas stations, dry cleaners, historical landfills, and residential activities. Groundwater quality approximately 3 miles to the southeast of the Project site has been impacted by the former IT Panoche Class I hazardous waste facility. The hazardous waste facility stopped receiving hazardous waste in 1987 and completed closure in 2000 under the oversight of the California Department of Toxic Substances Control (DTSC Envirostor 2010). Groundwater monitoring wells and vapor extraction wells are located on the IT Panoche site to identify and treat groundwater contaminants.

REGULATORY FRAMEWORK

This section describes the regulatory framework applicable to Hydrology and Water Quality.

Federal Clean Water Act

The Federal Water Pollution Control Act Amendments of 1972 and 1987, collectively known as the Clean Water Act (33 United States Code [USC] §1251 et seq.), establish the principal federal statutes for water quality protection. The Clean Water Act (CWA) was established with the intent "to restore and maintain

the chemical, physical, and biological integrity of the nation's water, to achieve a level of water quality which provides for recreation in and on the water, and for the propagation of fish and wildlife."

Section 303(d) of the CWA requires states to identify waters where the permit standards, any other enforceable limits, or adopted water quality standards are still not attained. Lists of prioritized impaired water bodies are known as the "303(d)" lists and must be submitted to the USEPA every two years. Section 303 also establishes the TMDL Program, which determines the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and provides an allocation of that amount to the pollutant's sources.

Section 402 of the CWA requires permits for discharges into water bodies such that the permitted discharge does not cause a violation of Federal and State water quality standards. National Pollutant Discharge Elimination System (NPDES) permits define quantitative and/or qualitative pollutant limitations for the permitted source, and control measures that must be implemented to achieve the pollutant limitations. Pollution control measures are often referred to as Best Management Practices, or BMPs.

Federal Emergency Management Agency

The Federal Emergency Management Authority (FEMA) prepares maps of flood zones. Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. The FIRM indicates zones for the 100-year flood. Within the 100-year flood zone, FEMA provides base flood elevations (BFE) derived from detailed analyses at selected intervals within these zones.

California Porter Cologne Water Quality Act

The California Porter-Cologne Water Quality Control Act (State Act) established the State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Boards). In California, the discharge permitting provisions of the federal Clean Water Act have been delegated by the U.S. EPA to the State and Regional Boards. The Regional Boards are responsible for the protection of beneficial uses of water resources within their respective regions. The State Act has led to development of water quality objectives to protect aquatic life from adverse impacts of numerous water quality constituents.

The Project lies within the jurisdiction of the San Francisco Bay Regional Board (Region 2). The San Francisco Bay Regional Board uses planning, permitting, and enforcement authorities to meet this responsibility, and has adopted a Water Quality Control Plan for the San Francisco Bay Basin to implement plans, policies, and provisions for water quality management in the area.

Non-Degradation Policy

In 1968, the State Water Board adopted Resolution 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California State," establishing a non-degradation policy for the protection of water quality. Under this policy, whenever the existing quality of water exceeds the quality necessary to maintain present and potential beneficial uses of the water, existing water quality must be maintained. This policy pertains to both surface waters and the groundwater of the State.

Industrial Activity Permitting

Mining activities at the Project site are subject to the requirements of the State Water Resources Control Board Water Quality Order no. 97-03-DWQ National Pollutant Discharge Elimination System General permit No. CAS000001 Waste Discharge Requirements for Discharges of Storm Water associated with Industrial Activities Excluding Construction Activities.

The General Permit, which is administered by the State Water Board, regulates discharges from certain types of industrial facilities, including mining operations. The General Permit requires the regulated facilities to (among other things):

- Prepare and maintain a Stormwater Pollution Prevention Plan (SWPPP);

- Implement stormwater best management practices (BMPs) to minimize discharge of pollutants in runoff;
- Conduct regular inspections of the facility, during both wet and dry weather;
- Collect and analyze samples of runoff at least twice per year from each discharge location; and
- Prepare and submit annual reports on stormwater management activities.

The current SWPPP (included as an Appendix to the Mining and Reclamation Plan found in Appendix A) for the Syar Quarry was developed in accordance with the State Water Board's Storm Water Management and Reporting Requirements as stated in Section B of the Water Quality Order No. 97-03-DWQ (General Permit No. CAS000001). The primary objectives of the SWPPP are:

- To identify and evaluate sources of pollutants associated with industrial activities that may affect the quality of stormwater discharges and authorized non-stormwater discharges from the facility.
- To identify and implement site specific best management practices to reduce or prevent pollutants associated with industrial activities in stormwater discharges and authorized non-stormwater discharges.
- To aid in the implementation and revision of the SWPPP required by Section A of the General Permit.

California Safe Drinking Water Act

The quality of water available for domestic use (drinking water) is regulated under the California Safe Drinking Water Act (California Health & Safety Code §116270 et seq.) and the California Domestic Water Quality and Monitoring Regulations (Title 22 California Code of Regulations §64401 et seq.). These State laws and regulations are at least as stringent as federal drinking water laws and regulations and California has been authorized by the U.S. EPA to operate its own drinking water program. The California Department of Public Health (CDPH), Office of Drinking Water is responsible for enforcing the State's drinking water program.

California Surface Mining and Reclamation Act of 1975

The Surface Mining and Reclamation Act of 1975 (SMARA), as amended, provides guidelines for mineral extraction designed to prevent or minimize the negative public health, property, and environmental impacts associated with surface mining. As related to hydrologic and water quality issues, the process of reclamation includes maintaining water quality, minimizing flooding and erosion damage to wildlife and aquatic habitats caused by surface mining. The requirements of the Act apply to any surface mining operations that disturb more than one acre or remove more than 1,000 cubic yards of material.

Solano County Road Improvement Standards and Land Development

Land disturbance within areas of Solano County that are not within the limits of a municipality that has the potential to increase stormwater runoff and volume from a site, shall reduce stormwater runoff to pre-project conditions. Chapter 31 of the Solano County Code provides the means for controlling soil erosion, sedimentation, increased rates of water runoff and related environmental damage. Section 31-30 of the County Code states that "no net increase in peak runoff due to development" is allowed. Methods for calculation are contained in the Solano Road Improvement Standards and Land Development Requirement (Solano 2006) and the Solano County Water Agency Hydrology Manual (Solano County Water Agency 1999).

Institute of Makers of Explosives

The Quarry currently follows the Best Practices for Blasting developed by the Institute of Makers of Explosives (Syar Industries, Inc. 2012). The Best Practices include training of explosives users, selection of the appropriate explosives for site-specific conditions, proper explosives loading and handling techniques, and attention to technical matters.

Goals and Policies of the Solano County General Plan

The following are the hydrology and groundwater goals, policies, and implementation programs from the Solano County General Plan that are applicable to this Project.

RS.G-1 **Manage and preserve the diverse land, water, and air resources of the county for the use and enrichment of the lives of present and future generations.**

RS.G-9 **Protect, monitor, restore and enhance the quality of surface and groundwater resources to meet the needs of all beneficial uses.**

RS.G-10 **Foster sound management of the land and water resources in Solano County's watersheds to minimize erosion and protect water quality using best management practices and protect downstream waterways and wetlands.**

RS.P-65 Require the protection of natural water courses.

RS.P-69 Preserve and maintain watershed areas characterized by slope instability, undevelopable steep slopes, high soil erosion potential, and extreme fire hazards in agricultural use. Watershed areas lacking water and public services should also be kept in agricultural use.

RS.P-70 Protect land surrounding valuable water sources, evaluate watersheds, and preserve open space lands to protect and improve groundwater quality, reduce polluted surface runoff, and minimize erosion.

RS.P-71 Ensure that land use activities and development occur in a manner that minimizes the impact of earth disturbance, erosion, and surface runoff pollutants on water quality.

RS.P-72 Preserve riparian vegetation along county waterways to maintain water quality.

RS.P-73 Use watershed planning approaches to resolve water quality problems. Use a comprehensive stormwater management program to limit the quantity and increase the water quality of runoff flowing to the county's streams and rivers.

RS.P-74 Identify naturally occurring and human-caused contaminants in groundwater in new development projects and develop methods to limit and control contaminants.

RS.I-66 Establish development standards that maximize retention of runoff and regulate development to avoid pollution.

EVALUATION CRITERIA WITH THRESHOLDS OF SIGNIFICANCE

Table 4.9-1 summarizes both the evaluation criteria and significance thresholds used to address potential impacts to hydrology and groundwater.

TABLE 4.9-1
Evaluation Criteria with Significance Threshold – Hydrology and Water Quality

Evaluation Criteria	As Measured by	Significance Threshold	Sources of Criteria
HWQ-1. Will the Project violate any water quality standards or waste discharge requirements, including through alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	Violation of water quality standards or waste discharge requirements.	Non-compliance with NPDES General Permit for Discharges of Stormwater Associated with Industrial Activities.	CEQA Guidelines Appendix G, Checklist Item IX (a)(c) State Water Board Water Quality Order No. 97-03-DWQ (General Permit No. CAS000001).
HWQ-2. Will the Project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or lowering of the local groundwater table level (e.g., the production rate of pre existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	Lowering of the water level in nearby domestic groundwater wells such that the production rates of the wells would not support existing uses.	Greater than 0 wells.	CEQA Guidelines Appendix G, Checklist Item IX (b)
HWQ-3. Will the Project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	Creation of runoff water that would exceed the capacity of the drainage system.	Non-compliance with Solano County standards.	CEQA Guidelines Appendix G, Checklist Item IX (d) Solano County Hydrology Manual Solano County Road Improvement Standards and Land Development Requirements

Evaluation Criteria	As Measured by	Significance Threshold	Sources of Criteria
HWQ-4. Will the Project create or contribute runoff water which would provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality?	Inadequate treatment of storm water runoff.	Non-compliance with NPDES General Permit for Discharges of Stormwater Associated with Industrial Activities.	CEQA Guidelines Appendix G, Checklist Item IX (e)(f) State Water Board Water Quality Order No. 97-03-DWQ (General Permit No. CAS000001).
HWQ-5. Will the Project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, place within a 100-year flood hazard area structures which would impede or redirect flood flows, or expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	Distribution of 100-year flood hazard zones.	Placement of structures within 100-year flood zone.	CEQA Guidelines Appendix G, Checklist Item IX (g)(h)(i) Solano County Hydrology Manual Solano County Road Improvement Standards and Land Development Requirements
HWQ-6. Will the Project substantially decrease surface-water contributions to Sulphur Springs Creek and Blue Rock Creek?	Reduction in contributing watershed area	Removal of watershed area that would deplete available infiltration capacity to sustain baseflows.	Solano County General Plan.

METHODOLOGY

Information contained within this section has been directly extracted or restated from the following reports prepared for the Project Applicant:

- *Lake Herman Quarry Proposed Expansion Surface Hydrologic Study*, prepared by Winzler & Kelly, April 2013. This report is included in Appendix G of this EIR.
- *Stormwater Pollution Prevention Plan Lake Herman Quarry*, prepared by AMEC, July 2009. The plan is included as an appendix to the Mining and Reclamation plan included as Appendix A of this EIR.
- *Mining and Reclamation Plan Lake Herman Quarry*, Prepared by Syar Industries, April 2013. The Plan is included as Appendix A of this EIR.

Groundwater

Local groundwater information was acquired from the Regional Water Quality Control Board, State Water Resources Control Board's databases (GeoTracker and GAMA), Solano County Resources Management Department, the City of Vallejo, and Solano County Water Agency (SCWA), the Greater Vallejo

Recreational District, Department of Water Resources (DWR) California Data Exchange Center (CDEC), and inquiries to adjacent properties. Data were acquired for groundwater levels, current groundwater pumping projects, environmental impacts to local groundwater, and future planned groundwater usage. Conclusions on Project site groundwater gradient and flow direction were drawn from digital elevation models, topographic maps, satellite images, and three shallow onsite groundwater monitoring wells and offsite monitoring wells two miles to the west. Information regarding springs and seeps were obtained from historical project information from Lake Herman Quarry operations (Pers. Comm., Jennifer Gomez, Syar Industries, 2010), from observations and historical aerial photographs dating back to 1937 (EDR 2010), as well as from a site visit performed in January 2011. Information was also acquired from Syar regarding historical quarry operations relative to observations of springs or seeps within the Project quarry and the outer edges of Sulphur Springs Mountain.

Surface Water

Existing surface water drainage patterns within the project area were obtained from the Stormwater Pollution Prevention Plan (Syar Industries, Inc. 2008) and the Mining and Reclamation Plan (Syar Industries, Inc. 2013).

To evaluate the effects of the proposed Project on surface-water runoff, a hydrologic analysis was conducted to determine pre- and post- Project peak runoff rates and volumes. The study followed the Solano County Road Improvement Standards and Land Development Requirements and the Solano County Water Agency Hydrology Manual. The study quantified the volume and rate of surface runoff at the Project site based on existing land uses and post-mined conditions for a 10- and 100-year precipitation event. As noted in the setting, the Project site was divided into nine sub-watersheds (basins) as depicted on Figure 4.9-2. Basin 4 encompasses the quarry pit, while the remaining basins encompass areas within the existing active quarry site.

For each onsite basin, version 3.3 of the U.S. Army Corps of Engineer's HEC-HMS model was used to estimate runoff volumes and peak discharges. HEC-HMS simulates the precipitation-runoff process in watersheds. In each watershed, representative overland flow paths were measured for use in determining the time of concentration. The time of concentration is used to determine how long runoff takes to travel from the furthest location in a basin to the basin's outlet. In this analysis, lag time was calculated using the Natural Resource Conservation Service (NRCS) Technical Release 55 (TR-55) methodology. The TR-55 methodology calculates the time for sheet flow runoff, shallow concentrated flows, and open channel flows. No baseflows (flow from groundwater) were assumed to occur because this model is attempting to capture the changes in flow due to changes in surface runoff characteristics.

For each basin a curve number (CN) was assigned based on the existing and proposed land uses. The CN indicates the runoff potential of a soil and is based on ground cover and the hydrologic soil group. A CN is attributed to land uses to measure the influence of land cover on infiltration and runoff rates. Curve numbers depend on the vegetative or impervious cover and land use practices. Hydrologic soil groups are classified ranging from high infiltration rate and low runoff potential (Soil Group A) to slow infiltration rate and high runoff potential (Soil Group D). The analysis accounts for the land use curve numbers, initial loss and lag time. Initial loss accounts for water not available for runoff from factors other than land use, such as evapotransporation.

IMPACTS AND MITIGATION MEASURES

Impact: **HWQ-1. Will the Project violate any water quality standards or waste discharge requirements, including through alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?**

Analysis: *Significant*

Most large mining projects rely on BMPs to control erosion and sedimentation. As described in the Regulatory Framework discussion above, these BMPs are employed on a site in conformance with a SWPPP, which is required by the Regional Board. The Quarry currently has, and adheres to, a SWPPP as part of their General Permit and

would continue to do so under the Project. The SWPPP describes and dictates management practices to prevent contaminants from entering storm water discharge and prevent unauthorized non-storm water discharges. The SWPPP includes BMPs to address erosion and sediment control, wind erosion control, source controls, and waste management. The Quarry is required to ensure that the SWPPP requirements are implemented at the Project site and that water quality standards are maintained.

The SWPPP would require modification as the Project progresses and as conditions warrant to remain consistent with changes that effect soil disturbing activities, site drainage patterns or any other activity that may impact storm water runoff quality. Areas that are currently not disturbed but will be disturbed as part of the Project would need to be included into the SWPPP and as site conditions change. The impact is considered potentially significant.

Mitigation: **HWQ-1 Update Industrial Storm Water Pollution Prevention Plan**

The Applicant shall amend the Quarry's existing Industrial SWPPP to reflect additional areas of land disturbance and changes in operation resulting from the Project. The SWPPP shall be modified as the Project progresses and as conditions warrant to remain consistent and compliant with State Water Resources Control Board Water Quality Order no. 97-03-DWQ National Pollutant Discharge Elimination System General permit No. CAS000001 Waste Discharge Requirements for Discharges of Storm Water associated with Industrial Activities Excluding Construction Activities.

The updated SWPPP shall identify the sources of pollution that may affect the quality of industrial stormwater discharges and authorized non-storm water discharges, and describe and ensure the implementation of best management practices to reduce or prevent pollutants in industrial stormwater discharges. The updated SWPPP shall also include monitoring measures and other requirements contained in Order No. 97-03. Implementation of the SWPPP shall include inspections and monitoring.

After Mitigation: *Less than Significant*

Implementation of HWQ-1 would reduce the impact to less than significant because it requires updating the existing Industrial SWPPP to account for the additional areas of land disturbance and changes in operation resulting from the Project. With continued compliance with the NPDES permit the potential impact to water quality would be less than significant.

Impact: **HWQ-2. Will the Project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or lowering of the local groundwater table level (e.g., the production rate of pre existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?**

Analysis: *Less than Significant*

Based on the best available regional geological evidence and on the materials (dense, relatively impermeable, basalt rocks with limited fracturing and deformation) that are being mined at the Project, the area of proposed excavation is not considered an aquifer or a water bearing unit that contributes significantly to the local water table. There are no industrial wells in the immediate vicinity of the Project site. In addition, existing mining activities do not use groundwater nor do future planned mining activities. No groundwater would be used during reclamation; therefore, neither the groundwater level nor the net groundwater volume is expected to be depleted or lowered as a result of the Project. Therefore, potential impacts to groundwater supplies would be less than significant.

A deeper regional groundwater elevation at the site is assumed to be greater than 70 feet msl (from downgradient groundwater monitoring well levels two miles west) and less than

150 feet (the pit floor elevation of 175 feet msl with no evidence of groundwater input). The Project includes lowering the base quarry elevation to sea level. Therefore, during the course of the Project, mining activities are likely to encounter groundwater. After that point, depending on surface water inflow, groundwater inflow, bedrock materials properties (fractures, joints, unit contacts, infiltration/percolation rates, etc.), evaporation rates, and the time of year, the quarry pit will start to gain or lose water levels.

After reclamation the quarry pit is likely to become a temporary (dependent of climatic and subsurface conditions) or permanent water body. The rate at which this may occur depends on future climatic conditions, bedrock materials and fracture properties. The water body would likely reach equilibrium with the local groundwater level within a few years and if water levels become higher may function as a source of groundwater recharge. Therefore, after reclamation is completed the Project site condition will not interfere substantially with groundwater recharge such that there would be a lowering of the local groundwater table.

In the case of gaining water during the course of lowering the baseline elevation of the quarry pit, water would continue to be pumped for quarry operations and to the settling pond per current quarry activities. If dewatering of the quarry pit causes a small decline in the groundwater levels of immediately surrounding wells it is not likely to occur greater than ¾ mile from the site. There are no current water supply wells in use within ¾ of a mile of the Project site quarry pit, therefore; potential impacts would be less than significant.

Mitigation: No mitigation is necessary.

Impact: HWQ-3. Will the Project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

Analysis: *Less than Significant*

The Project would alter the existing drainage patterns at the site. Expansion of the Quarry could lead to increased runoff due to removal of vegetation and the creation of compacted surfaces. Culverts, storm drains, seasonal drainage swales, and inlet and outlet structures would need to be constructed to convey surface-water flows around the disturbed areas. Prevention of localized flooding would depend on adequately sizing the onsite drainage features. The County requires that drainage features be designed in accordance with the Solano County Road Improvement Standards and Land Development Requirements as well as the Solano County Water Agency Hydrology Manual.

The improvements to Lake Herman Road would occur along an approximately 2,280-foot segment of the Lake Herman Road from the Solano County/Vallejo City limit line to several hundred feet east of the Lake Herman Quarry entrance. Much of the increased paving that would result from the improvements would occur on the southwest side of Lake Herman Road and would increase the roadway width by as much as 22 feet. Improvements on the northeast side are limited to the entrance and the approach to the entrance. The existing road varies in width from 23 to 47 feet through the segment planned for improvement.

A comparison of the peak runoff rates and volumes for the 10- and 100-year 24-hour storm event is presented in Table 4.9-2 and 4.9-3. The watershed areas for the seven basins would decrease in area as a result of proposed Project and therefore the peak runoff rates and volumes from these basins would decrease under Project conditions. Basin 4 would continue to consist of a quarry pit which acts as a large detention basin that would not contribute runoff off-site.

TABLE 4.9-2
Peak Runoff Rate: Existing and Project Conditions

Basin ID	10 YR, 24 hr Peak Runoff Rate (cfs)			100 YR, 24hr Peak Runoff Rate (cfs)		
	Existing Conditions	Project Conditions	Percent Difference	Existing Conditions	Project Conditions	Percent Difference
1	38.1	29.1	-24%	46.7	35	-25%
2	66.9	52.8	-21%	82	63.3	-23%
3	59.2	55.3	-7%	72.4	67.2	-7%
4	*Active Quarry Pit*					
5	4.9	5.1	0%	5.7	5.7	0%
6	98	18.4	-81%	123	21.4	-83%
7	23.2	22.7	-2%	26.9	26.3	-2%

TABLE 4.9-3
Runoff Volume: Existing and Project Conditions

	10 YR, 24 hr Runoff Volume (ac.-ft.)			100 YR, 24hr Runoff Volume (ac.-ft.)		
	Existing Conditions	Project Conditions	Percent Difference	Existing Conditions	Project Conditions	Percent Difference
1	15.6	11.5	-26%	24.4	18.0	-26%
2	27.2	20.5	-25%	42.8	32.3	-25%
3	24.1	22.2	-8%	37.8	34.8	-8%
4	*Active Quarry Pit*					
5	1.1	1.1	0%	1.9	1.9	0%
6	41.7	6.0	-86%	65.7	9.4	-86%
7	7.7	7.6	-1%	12.1	7.6	-37%

Alteration of the existing drainage patterns resulting in an increased volume and rate of runoff to onsite drainages could result in impacts to Blue Rock Springs Creek which eventually discharges to Lake Chabot and ultimately Napa River. Similarly, increased volume and rate of runoff to onsite drainages could result in impacts to Sulphur Springs Creek which drains to Lake Herman and ultimately San Pablo Bay. An increased volume and rate of runoff could increase/cause bank erosion in unstable channels and increased sediment transport and loading to receiving waters as well as exceed the capacity of existing stream channels resulting in water channels spilling over and flooding of adjacent lands.

A preliminary detention pond analysis was conducted to determine if approximate detention ponds would be necessary to keep runoff rates and volumes to pre-project conditions. The resulting analysis concluded that there was no increase in runoff rates or volumes. Multiple detention pond sizing methods were used and as described in Appendix G, hydrology standards include methods outlined in the Erosion and Sediment Control Field Manual published by the San Francisco Bay Regional Water Quality Control Board (RWQCB 2002) and the Solano County Water Agency Hydrology Manual.

Mitigation: No mitigation is necessary.

Impact: **HWQ-4. Will the Project create or contribute runoff water which would provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality?**

Analysis: *Significant*

Proposed quarrying activities would include earthmoving such as rough grading and soil stockpiling. These types of activities expose soil to erosion that, in turn, can result in discharge of sediment to receiving surface water bodies. Sediment can degrade water quality and adversely affect the habitat of aquatic species. Mining operations also generate other pollutants such as diesel and hydraulic fluid that if released to the environment could degrade receiving water bodies. The Project includes onsite storage of petroleum products and other hazardous materials. Operation, storage, maintenance, and repair of mining equipment will occur as part of the Project. These activities will require the use, transport, transfer, and storage of fuels, lubricants, and cleaners. Spills or leaks of these petroleum products and other hazardous materials could affect surface-water quality if not properly stored and handled. This is considered a significant impact.

As discussed in Impact HWQ-1 above, the Quarry currently has, and adheres to, a SWPPP as part of their General Permit for Industrial Activities and would continue to do so under the Project. The SWPPP includes BMPs to address erosion and sediment control, wind erosion control, source controls, and waste management. Mitigation Measure HWQ-1 would require the Applicant to amend the existing Industrial SWPPP to reflect additional areas of land disturbance and changes in operation resulting from the Project. With continued compliance with the General Permit, the potential impact to water quality would be less than significant.

In addition to Mitigation Measure HWQ-1, the use and storage of hazardous materials would be required to comply with federal, State, and local hazardous materials laws and regulations. Regulations require the Quarry to maintain and update a Spill Prevention and Countermeasure Plan, a Hazardous Materials Business Plan, and an Emergency Response Plan, and the Quarry has an established employee training program focusing on the proper use, storage, handling and cleanup of each chemical. Implementing these plans and policies would minimize the risk to water quality. Concerning groundwater, the Project area is not considered to overlay an aquifer or a significant water bearing unit, and the subsurface is a hard, relatively impermeable consolidated rock. Therefore, even in the case of a catastrophic release of hazardous materials to the open pit surface water, it is unlikely that those impacts would substantially degrade groundwater quality or supply.

Mitigation: **HWQ-1 Update Industrial Storm Water Pollution Prevention Plan**

After Mitigation: *Less than Significant*

Implementation of HWQ-1 would reduce the potential impact to surface water quality to less than significant because it requires updating the existing Industrial SWPPP to account additional areas of land disturbance and changes in operation resulting from the Project. With continued compliance with the NPDES permit the potential impact to water quality would be less than significant.

Impact: **HWQ-5. Will the Project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, place within a 100-year flood hazard area structures which would impede or redirect flood flows, or expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?**

Analysis: *Significant*

The main quarry site is not located within a Federal Emergency Management Agency (FEMA) 100-year or 500-year flood zone. However, the proposed bridge replacement crossing located on Sulphur Springs Creek is located within a designated FEMA 100-year floodplain Zone A (FEMA 2009).

FEMA defines Zone A floodplain as a floodplain which has no base flood elevation and has not been hydraulically modeled by FEMA. Base Flood Elevation (BFE) is defined by FEMA as the water surface elevation of a watercourse or water body, referenced to an established datum that corresponds to a flood event that has a one percent chance of being exceeded in any given year. Residential and commercial buildings within a jurisdiction that participate in the FEMA National Flood Insurance Program (NFIP), must be constructed above the 100-year BFE. Bridges are not required by FEMA to be constructed above the 100-year BFE. However the Solano County Road Improvement and Land Development Guidelines require that all bridges be designed to pass a fifty-year storm with a minimum of two feet of freeboard, and pass a one-hundred-year storm with no freeboard.

The proposed bridge, if not designed to provide adequate hydraulic capacity, could result in adverse impacts to the bridge or Sulphur Springs Creek during high flow events.

The proposed Project would not be subject to impacts associated with dam failure and inundation. The closest dam is Lake Herman, which is approximately 1.5 miles to the southeast of the Project site. Based on that distance and given the topographic characteristics of the site, flood water generated from failure of the Lake Herman dam would not reach the Project site. Further, the Project site is not mapped in any dam inundation hazard as defined by the Association of Bay Area Governments (ABAG, 1995). Dam failure is not considered a potential impact to the proposed Project.

Mitigation: **HWQ-5 Sulphur Creek Bridge Design**

The Applicant shall design the bridge replacement to be compliant with the Solano County Road Improvement and Land Development Guidelines and subject to review and approval by the Local Solano County Floodplain Administrator. Components of the design shall address the following Guideline components:

1) Streams, which carry large floating debris, may require greater freeboard.
2) Abutments shall be protected from erosion damage. This may necessitate the use of rock slope protection or other suitable materials and methods.
3) Abutments on fill material will not be allowed unless supported on piles and the fill is adequately protected from erosion.

After Mitigation: *Less than Significant*

Implementation of Mitigation Measure HWQ-5, Sulphur Creek Bridge Design, would require the bridge to be designed to meet the bridge design criteria in the Solano County Road Improvement and Land Development Guidelines which addresses design of structures within a flood plan.

Impact: **HWQ-6. Will the Project substantially decrease surface-water contributions to Sulphur Springs Creek and Blue Rock Creek?**

Analysis: *Less than Significant*

The watershed areas of Sulphur Springs Creek contributing to Lake Herman and Blue Rock Springs contributing to Lake Chabot would be reduced as a result of the Project. Reduction of watershed catchment area reduces infiltration potential during precipitation events and thereby can reduce subsurface recharge and sustained baseflows in hydrologically connected receiving watercourses. The total watershed areas of Sulphur Springs Creek and Blue Rock Springs Creek contributing to Lake Herman and Lake Chabot, respectively, have been tabulated in Table 4.9-4. The contributing area removed from these watersheds as a result of the Project has also been tabulated in Table 4.9-4 with the resulting percent difference.

TABLE 4.9-4
Size of Watershed for Lake Herman and Lake Chabot

Watershed	Approximate Total Watershed Area (acres[1])	Area Removed for Quarry Expansion (acres)	Percent Difference
Lake Herman (via Sulphur Springs Creek)	4,490	85	1.9%
Lake Chabot (via Blue Rock Springs Creek)	1,696	8	0.5%

1. Calculated using ARCGIS.

Low flow regimes or baseflows in Sulphur and Blue Rock Springs Creeks are sustained from local groundwater aquifers that are recharged by precipitation that falls and infiltrates into the subsurface geology of the contributing watershed area. The infiltration capacity of the sub-surface soils present in the Lake Herman and Lake Chabot watershed areas (1.9% and 0.5%, respectively) to be removed are very low given the rock-dominated geology. The low infiltration capacity results in a low groundwater recharge potential. Given the minimal reduction in watershed area coupled with the existing low infiltration capacity of the rock-dominated geology, the removal of the watershed areas would not adversely impact the surface-water contributions that sustain baseflows in Sulphur Springs Creek and Blue Rock Springs Creek. The decrease in surface-water contributions is considered less than significant.

Mitigation: No mitigation is necessary.

CUMULATIVE IMPACTS

Impact: **HWQ-C1. Will the Project's incremental effect on hydrology and groundwater be cumulatively considerable, based on evaluation criteria 1 through 6?**

Analysis: *Less than Significant*

The Project could increase the rate and volume of stormwater runoff from the site in addition to contributing pollutants to surface waters. However, the Project would be required to comply with existing water quality permits that protect existing or potential beneficial uses of the receiving water.

The Project would comply with County standards which require that the difference between pre- and post-construction runoff be detained on site. This would require continued operation and maintenance of existing stormwater detention basins. Compliance with County and State policies and regulation would ensure that stormwater controls are adequately sized to treat storm water runoff. The treatment of on-site runoff for the Project includes implementing and maintaining BMPs as specified in the SWPPP. These controls would treat storm water runoff from the Project site as well as help reduce project runoff into Sulphur Springs Creek and Blue Rock Springs Creek.

Additionally, future projects within the watersheds that would include potential alterations to drainage patterns and stormwater runoff quantity and quality would be subject to similar requirements and onsite mitigations such that cumulative impacts could be avoided or otherwise mitigated. Therefore, the Project's contribution to the cumulative impact is not cumulatively considerable.

After reclamation, the quarry pit is likely to remain a temporary or permanent water body. The water body would likely reach equilibrium with the local groundwater level within a few years and if water levels become higher may function as a source of groundwater recharge. Therefore, after reclamation is completed the Project site condition will not interfere substantially with groundwater recharge such that there would be a lowering of the local groundwater table. Also, groundwater in the vicinity of the Project site is most likely replenished by percolation from higher elevations hills, subsurface inflow from the adjacent basins and sub basins, rainfall on the valley floors between the hills, and percolation from urban water usage (artificial recharge) in the lower elevations to the west and south. Finally, groundwater elevations maintained in the quarry's monitoring wells MW-1 and MW-3 (assumed here to be representative of relatively shallow, perched groundwater surrounding the mountain) are approximately 200 feet greater in elevation than the existing quarry surface water elevation. This implies there is no connectivity (as seeps or springs inside the quarry pit) between shallow groundwater in the vicinity of the Project and the bedrock materials being mined from the quarry; therefore, the Project's impact to groundwater is not cumulatively considerable.

Mitigation: No mitigation is necessary.

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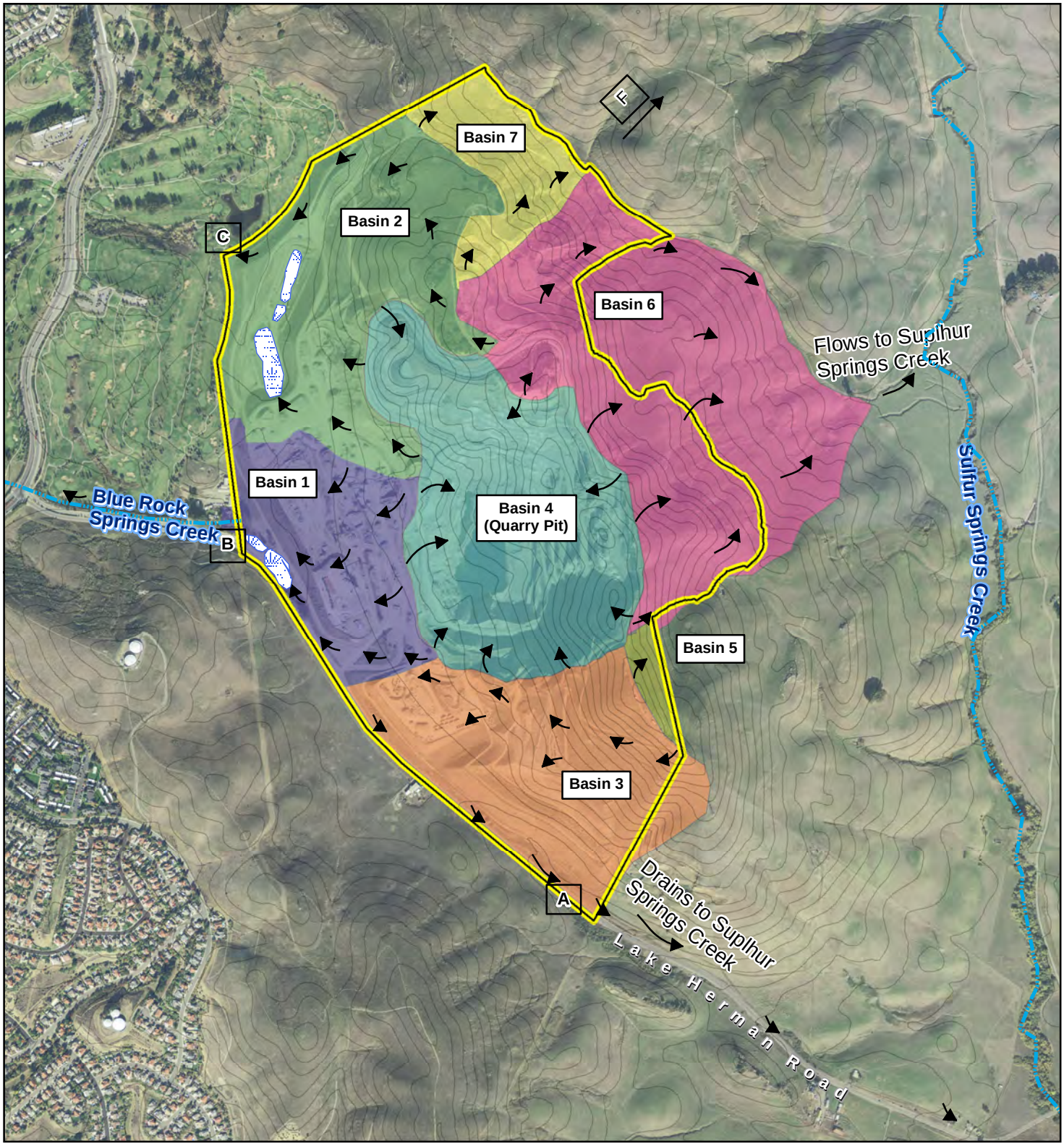

30 ft. Countour

Overland Flow Paths

Basin Delineation (Typical)

Project Area

Existing Detention Ponds

A — Existing Outfall and Sampling Location, (Typical)

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Feet
Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

N

Solano County
Lake Herman Quarry EIR

Existing Conditions
Basin Delineation

Job Number	1174109001
Revision	A
Date	22 Apr 2013

Figure 4.9-1

718 Third Street Eureka CA 95501 USA T 707 443 8326 F 707 444 8330 E eureka@ghd.com W www.ghd.com

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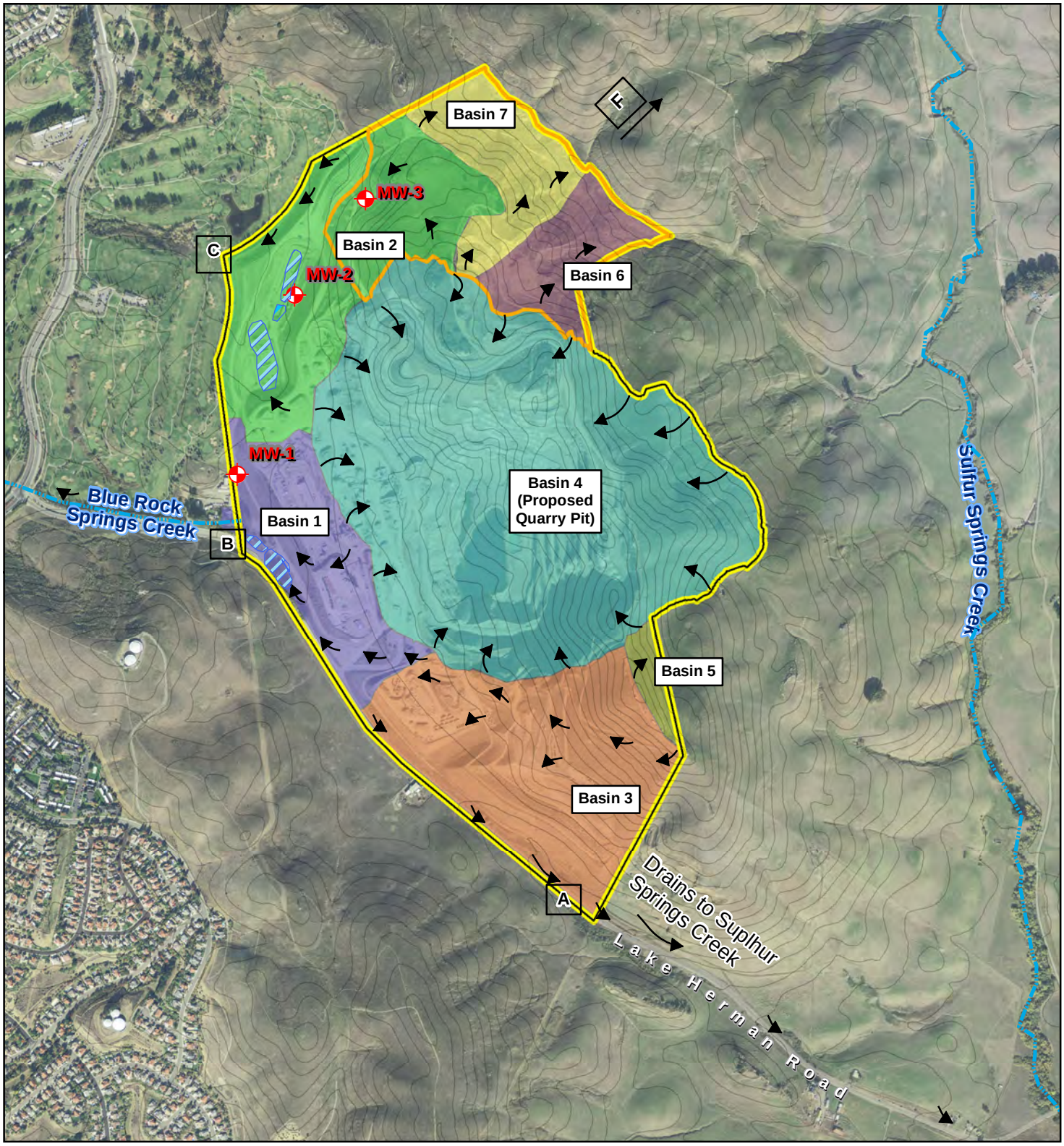
Data source: USDA: Aerial NAIP 2009 1 meter resolution; Solano County GIS: Parcels, Blueline Streams.. Created by:gldavidson



30 ft. Countour

Basin Delineation (Typical)

Existing Detention Ponds

Monitoring Well

Overland Flow Path

Project Area

A Existing Outfall and Sampling Location, (Typical)

Area of No New Impact

Paper Size 8.5" x 11" (ANSI A)
0 240 480 720 960 1,200
Feet
Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California II FIPS 0402 Feet

N

Solano County
Lake Herman Quarry EIR

Proposed Project
Basin Delineation

Job Number	1174109001
Revision	A
Date	22 Apr 2013

Figure 4.9-2

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Data source: USDA: Aerial NAIP 2009 1 meter resolution; Solano County GIS: Parcels, Blueline Streams. Created by:gldavidson

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